

Organic Chemistry

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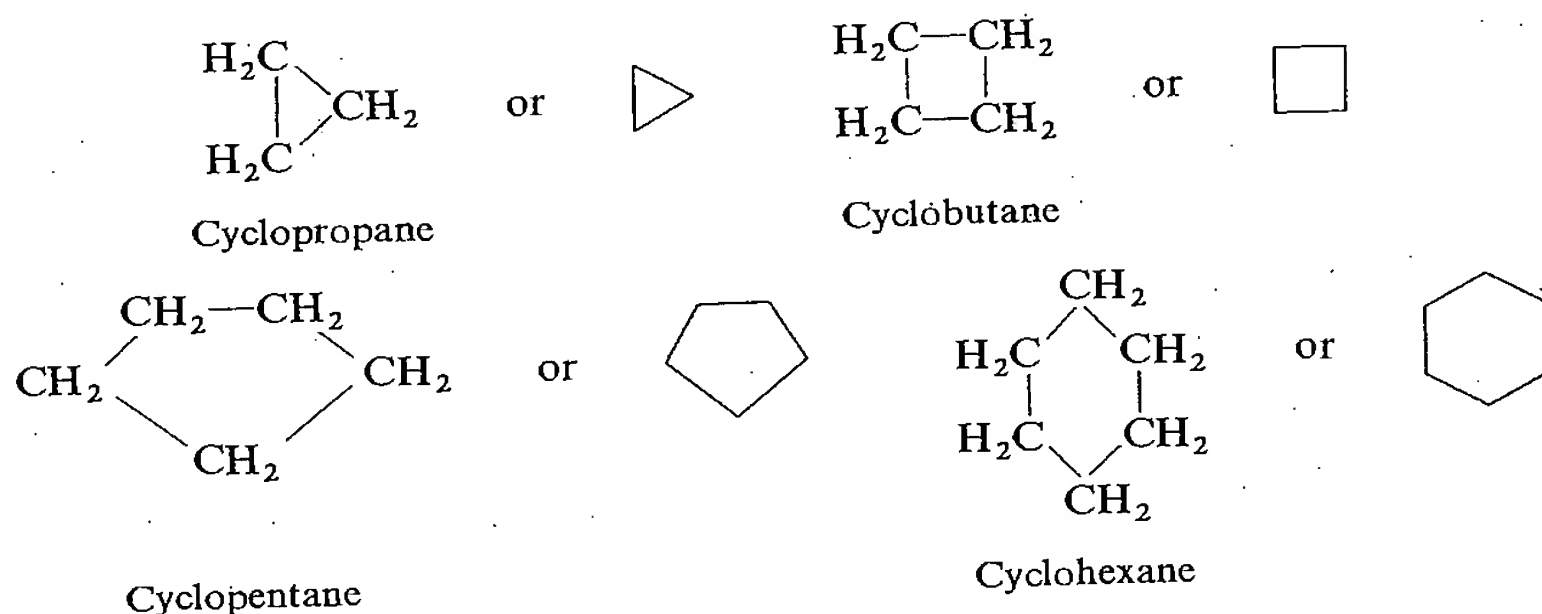
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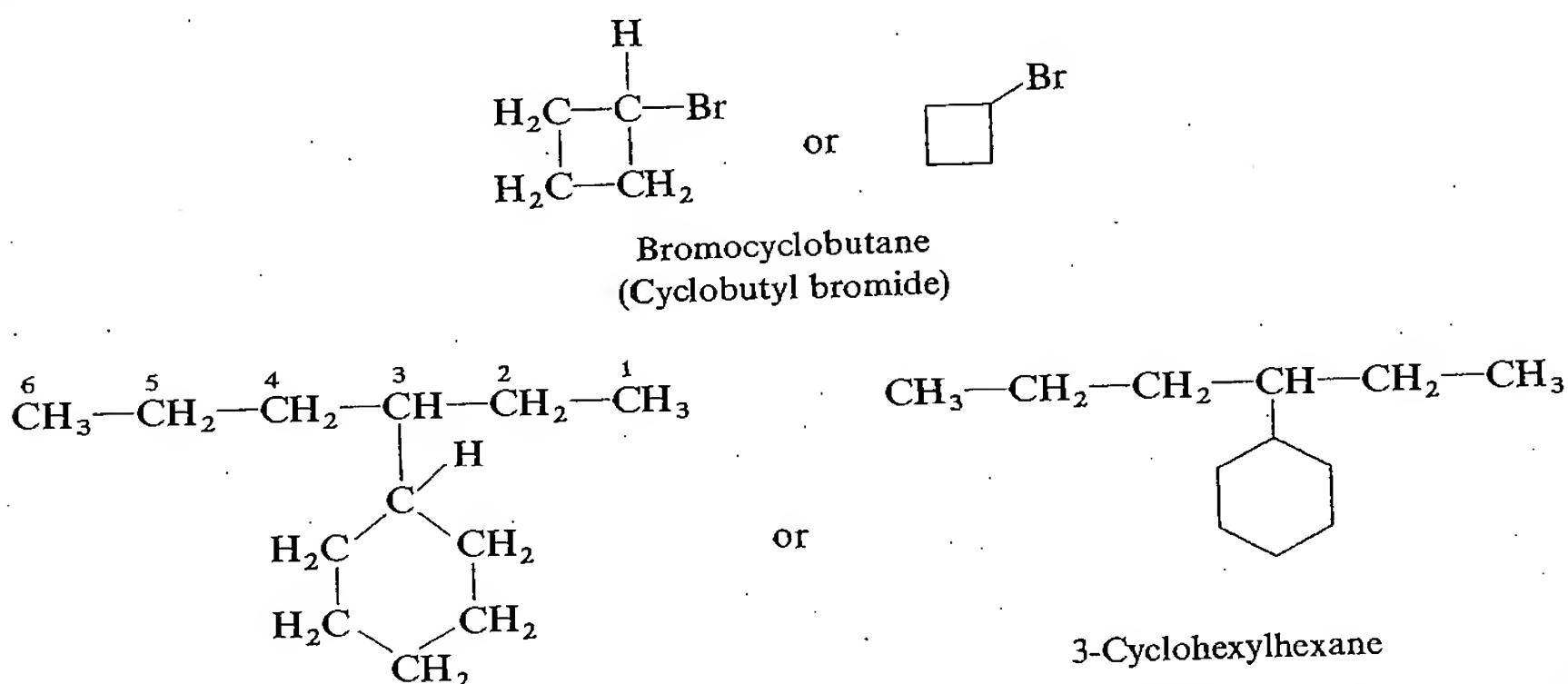
The result is a new carbon-carbon bond and a cyclic structure. Note, however, that hexane has all tetrahedral sp^3 hybridized carbon atoms and we might anticipate having tetrahedral sp^3 hybridized carbon atoms in cyclohexane, which indeed we do. Even though alkanes and cycloalkanes have different molecular formulas, C_nH_{2n+2} and C_nH_{2n} , respectively, they might be expected to have similar physical and chemical properties because of the tetrahedral carbon atom; we find this to be true also.

Cycloalkanes are named by placing the prefix *cyclo* in front of the name of the alkane that has the same number of carbon atoms. Some typical cyclic structures follow, both with all the carbon and hydrogen atoms shown and in the more conventional form as simple *line structures* (that is, a triangle to represent cyclopropane, a square for cyclobutane, a pentagon for cyclopentane, a hexagon for cyclohexane, and so forth).



When the line structures are used, it is assumed that one carbon and two hydrogens (that is, CH_2) are located at each corner unless substituents are attached.

Substituted cycloalkanes are usually named as a derivative of the cycloalkane itself. As with alkanes, cycloalkyl names can also be used. Examples of *monosubstituted cycloalkanes* are:



This has been named as a derivative of hexane; cyclohexane name for the six-membered ring has been changed to *cyclohexyl* and treated as an alkyl—in this case, cycloalkyl—substituent.

Disubstituted and other more highly substituted cycloalkanes are almost always named as a derivative of the cycloalkane. IUPAC nomenclature requires that the cyclic structure be numbered so that the substituents are given the lowest possible numbers. This approach is the same as for alkanes (see Sec. 3.10), as the following examples illustrate: